

Plan Title:	Field Integrated System Development
Plan Number:	CB-FD-94-01-E
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PART I - INFORMATION TECHNOLOGY ARCHITECTURE PLAN

1. Information Requirements

The Bureau of the Census is the primary source of statistics about the population and economy of the Nation. These statistics are collected to assist the Congress, the Executive Branch of the Federal Government, state and local governments, colleges and universities, and the general public in the development and evaluation of social and economic programs.

The mission of the Field Division and the Technologies Management Office is to plan, organize, coordinate, and carry out the Census Bureau's field data collection program for the decennial census, surveys, and special censuses. This is done by maintaining and administering a flexible field organization through the regional offices, regional census centers, telephone centers, temporary local census, and other branch or area offices.

We are trying to achieve certain goals. Primary among these are:

- Migrate to open systems technologies
- Build expandable and contractible data collection systems
- Provide solutions which will be portable among hardware and software architectures
- Integrate the various automated systems to ensure compatibility and eliminate duplication of effort
- Provide a network infrastructure to support Computer-Assisted Interviewing (CAI) technologies, the geographic support system, and a regional office electronic mail system

The Field Division and Technologies Management Office are continually adding, enhancing and upgrading various automation tasks associated with field operations. Field Division and Technologies Management Office staff use microcomputers for data analysis, report generation, word processing, file transfers, electronic mail, scheduling, and project management. The Field Division and Technologies Management Office will provide support staff with access to state-of-the-art equipment, which is needed to complete their duties and meet goals within projected deadlines.

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The Field Division/Technologies Management Office will continuously evaluate operational feasibility, cost-effectiveness, and data quality. Our objective is to identify and eliminate labor-intensive activities that are costly and time-consuming and improve control and feedback mechanisms without compromising the quality of data collected or processed. This is a long term plan in which we will work closely with the CASIC staff, Geography Division, and Decennial Management Division to evaluate and implement new hardware and software products.

Hardware will include mainframe, micro and minicomputer platforms for Headquarters; Jeffersonville, Indiana; Tucson, Arizona; Hagerstown, Maryland; the regional offices, regional census centers and local collection offices. Software will consist of (1) data base management technology (DBMS), (2) standard 3GL programming languages, (3) state-of-the-art application development tools such as 4GL languages, forms management and report-writing products, and (4) computer-aided software engineering (CASE) tools, and (5) Geographic Information System (GIS) software. Design approaches will include (1) object-oriented programming techniques and (2) will explore the use of expert (artificial intelligence) systems.

Most of the Field Division involvement in geographic operations is covered in the Geographic Support System Concept 5-Year IT plan. Concept Number: CB-DC-94-01-E.

We anticipate that automation of data collection activities and systems integration will reduce costs and survey processing time while improving data quality. This will be realized by:

- Combining data collection and data capture.
 - Eliminating clerical preparation, maintenance, and control activities associated with data collection or capture.
 - Collecting detailed cost and progress information that will allow for closer monitoring and better management of field activities.
 - Incorporating quality checks into the data keying process that will improve data quality.
 - Integrating the various components of regional office automation to eliminate duplicate systems development and maintenance.
 - Eliminating duplicate keying between the various systems.
 - Introducing and using hardware, software and system standards.
 - Identifying additional tasks that will benefit from automation.
 - Allow for rapid systems development and prototyping.
 - Enabling us to work closely with our end users to develop a system that meets their needs.
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- Expanding automation possibilities for the next decennial by designing survey systems that can be used for decennial.
 - Re-engineering Field processes to take full advantage of available technology.
 - Supporting digitizing controls and reports.
 - Supporting new staff with the purchase of PCs/printers, which provides the ability to move large databases and easily access them.

- Introducing and using imaging technology to capture data for processing.

Our main objective is to ensure that our technology plans support the Census Bureau's strategic goals. To automate effectively, we are developing various components of regional office automation which are integrated and can interact with the automated data collection tools. To reduce development and maintenance efforts, we are developing systems for surveys/geography which are expandable to meet the needs of the decennial census. We are also exploring ways to provide regional office managers with more timely survey management data which will produce more efficient survey/decennial operations. We have given attention to the enhancement of basic tasks such as providing sample address lists to the regions, data collection, case management, check-in, process control, cost and progress reporting, data entry, electronic troubleshooting and messaging capability, and field representative/enumerator performance measures. We will evaluate both centralized and decentralized alternatives and incorporate new technology where applicable and cost-justifiable.

This concept is directly related to the Computer-Assisted Survey Information Collection (CASIC) Concept since most of the tools which will be used are being developed under the umbrella of the Census Bureau-wide CASIC concept. The CASIC concept is an overview of the entire CASIC vision and describes this vision from initial research and development efforts to eventual implementation and production use. Field Division also uses many of the TIGER tools developed by the Geography Division.

MAJOR PROJECTS PLANNED

This concept focuses on how the Field Division/Technologies Management Office will enhance the methods and tools that are used by Headquarters and regional field offices to provide our sponsors with more timely and effective data collection. It includes the following components: data entry (CADE), cost and progress, System to Automate the Regions (STAR/RAM), Survey Performance and Management (SPAM), support desk, decennial, office operations, Computer Assisted Personal Interviewing (CAPI), Computer Assisted Telephone Interviewing (CATI), Pre-Appointment Management System/Automated Decennial Administrative Management System (PAMS/ADAMS), Decennial Field Interface (DFI), Master Address File (MAF) and Touchtone Data Entry/Voice Recognition Entry (TDE/VRE).

The various components of the Field Integrated System Development are CAPI control, CATI support, data keying, survey management, field representative performance, Cost and Progress (CNP), recruiting, automated training, and an electronic support desk. Many of these components share common data elements and are in various stages of automation. Eventually, these sub-systems will be fully automated and integrated. These subsystems do not necessarily have to be written in the same software or run on the same hardware but must easily exchange information. We are working to eliminate duplicate keying and storage of the same data elements in separate systems.

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As the Census Bureau's data dissemination methods become more and more automation intensive and Internet based, the Field Division/Technologies Management Office will need to ensure that all Field staff have state-of-the-art equipment to keep pace.

2. Planned Processing and Telecommunications Architecture

Areas to be addressed by this Field Integrated System Development Concept include:

- Data Entry - Receipts processing, which may include check-in, screening and preliminary editing, data capture, coding, and problem resolution.
- Cost and Progress - The ability to track survey or census cost and current status.
- STAR/SPAM - Automated survey control which included sample control, case assignment, check in, survey progress information, and field representative performance.
- Decennial - Joint development of technologies to directly support the 2000 decennial census (PAMS/ADAMS, CCF, MAF).
- Office Operations - Administrative support functions for headquarters and field regional offices.
- CAPI/CATI - Computer-assisted personal and telephone interviewing.
- Field Representative Automation Payroll System (FRAPS)
- CENCATI - A replacement for the microCATI system based on the CASES software.
- Network and application monitoring - Provide proactive management of our network based production systems.
- LAN/Communications Operations - Provide upgraded communications capabilities for Field Division/Technologies Management Office.
- Other Regional Office Automation - Automate our training activities.

Following is a description of the above categories, how technology resources are currently used within each, and the additional resources needed to fully integrate these categories.

A. Data Entry

The Census Bureau has used centralized data entry since the 1960s. We first introduced decentralized data entry for the 1980 decennial census, and we have used it in the regional offices since then. We initially used Nixdorf data entry equipment in the regions and Jeffersonville beginning in 1980. Jeffersonville replaced its Nixdorf equipment with Tartan systems in 1986 and has subsequently done development on DEC VAX equipment. We processed all data entry for the 1990 decennial census on DEC VAX hardware. The regional offices converted from Nixdorf to VAX in October 1991.

Survey questionnaires are keyed in Jeffersonville. The regions key the Consumer Expenditure (CE) Survey, the Survey of Income and Program Participation (SIPP), the Annual Housing Survey (AHS), and Permit Address Listings (PAL). As CAPI technology is implemented for survey, regional office keying operations will be eliminated. To ensure economies of scale, we

are reviewing plans with the CASIC staff for moving any data keying still in the regions after 1996 to Jeffersonville.

We automated the quality control for regional office data entry and reprogrammed the reports to run on the VAX rather than the mainframe. We will maintain these systems until centralization of data keying using CASIC tools is completed.

B. Cost and Progress

A key to successful survey/decennial management is timely cost and progress information. Our short term goal is to provide managers with more timely data to make decisions based on daily, weekly, or monthly cost and progress reports. For the long term, we plan to create a system that will work for surveys, but can expand to provide the same information for a decennial census.

The daily reporting of cost and progress information provided field managers with timely data during the 1990 decennial census. Current survey field representatives do not report cost and progress daily. Field Division conducted a test of touchtone input and audio response processing to collect daily cost and progress information for current survey field representatives. This system provided timely payroll, operational costs, and work progress information.

We are developing the cost and progress system in phases. In the first phase, we made payroll and personnel data available in a database to the regional offices. Regional office personnel key some additional cost and survey data. The regions access the database to create cost reports.

We are working closely with staff from the Personnel Division and the Administrative and Networking Support Office (ANSO) to convert the FR's payroll system from FAPS to NFC beginning in June 1996. The cost and progress systems may need to be revised to accommodate this conversion. The system ultimately chosen for this conversion will require procurement of hardware and software to support the revised system in FY 1996-1997.

Phase one is a VAX-based system currently using existing FLD-owned equipment in the regional offices. Phase two will be operational by FY 1996, and will be processed on existing computer hardware/software owned by FLD Division, or will co-exist on computer hardware procured as a result of the Computer-Assisted Survey Information Collection (CASIC) research.

Phase two will provide a direct link between cost and progress, downloading data from the check-in system to eliminate keying survey progress data into the system. It will include the development of the collection control file and reports that will be used for the 2000 decennial census. There will be some standardized reports which the system automatically produces. The regions will also have the ability to produce custom reports.

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Phase three will accommodate the electronic capture of payroll data, either through a CAPI or a telephone Touchtone Data Entry (TDE) system. Reports can be generated on a daily, weekly, or monthly basis.

C. STAR/RAM

We developed the STAR/RAM system in the field in 1985 to automate the process of survey control. Regional offices have modified the various STAR/RAM systems to accommodate their individual needs.

The 1990 sample redesign changed the Primary Sampling Unit (PSU) from three digits to five digits. Additional information is available on the input file. Instead of revising the outdated STAR system to accept the new input, we will rewrite the STAR/RAM systems, taking advantage of advances in technology, and making it more compatible with other Census applications. This interim system will interact with the Master Sample Control File that Statistical Method Division is preparing. Eventually, the STAR/RAM system will be replaced with CASIC tools when we fully convert each survey to CATI/CAPI.

The existing RAM system, which is primarily used for field representative performance, will be totally redesigned to handle both the existing paper surveys, CPS CAPI and all future CAPI/CATI surveys. This new system will be renamed SPAM and will be field representative specific rather than survey specific as RAM was. Development began in FY 1994 using Paradox software and was designed to be a decentralized application in the twelve regional offices. Data from all surveys will be accumulated in headquarters and transmitted out to each of the 12 databases located in the regions. Additional software licenses and equipment will be needed once all survey performance has been converted from RAM to SPAM. This total conversion is expected to be accomplished in FY 1996.

D. Decennial

There will be a high concentration of automation (hardware and software) at each of the regional census centers and a minimum of automation at each of the local collection offices (LCOs). The LCOs will have dial up access to the regional census centers primarily for file transfers. The regional census center will be designed for an open systems environment with individual processing functions utilizing a shared platform, possibly even utilize independent operating systems. The LCO configuration will be a turnkey (i.e., "out-of-the-box") operation.

The proposed field configuration for the Census 2000 concentrates on all major field processing at the regional census centers and minimizes the processing requirements at the local collection office level. The basic processing functions to be performed are:

- Master Address File (MAF) Updates
- Digitizing of updates for mapping, problem resolution, and file updating (TIGER update).

- Local Update of Census Addresses (LUCA)
- Map production
- Decennial Field Interface (DFI) processing, Field cost and progress reporting and providing information to the decennial management information system
- Administrative processing which provides for PAMS/ADAMS database and supporting software. This integrated system supports, electronically, the local collection offices with data capture for regional/decennial applicants, satisfies the applicant name check requirements, generates applicant selection lists and performs all personnel and payroll activities.
- Integrated Coverage Measurement (ICM) which is a process designed to estimate the number of people missed in the decennial census.

Specific equipment requirements have not been determined, but will be documented in future IT plans once they are finalized.

E. Office Operations

We installed microcomputers in the regional offices in the mid-1980s to provide office automation support and for the development of survey control applications (STAR and RAM). We have replaced most of the older hardware with a mix of 386 and 486 systems. We will no longer be upgrading machines, but are now in the process of replacing older machines with pentium class technology.

In March 1988, we installed a DEC minicomputer (MVII) to enhance office automation requirements and to provide geographic and outreach support. This system included an ethernet configuration so we could network the regional offices with each other and with Headquarters. In FY 1991, we placed a second DEC minicomputer (MV3500) in each regional office to support the CPS/CAPI application and the conversion of data entry from Nixdorf. We are in the process of phasing out the MicroVAX systems in the regional offices. Our goal is to eliminate all MicroVAX II systems by late 1997.

During FY 1992, each regional office had a microcomputer-based LAN running Novell's Netware. It is fully compatible with the Field headquarters' LAN and includes standard versions of WordPerfect, QuattroPro, and Paradox software. It incorporates the VAX minicomputers and communicates with Headquarters via high-speed (56k baud\T-1) network links. We have completed the process of working with the Telecommunications Office (TCO) to upgrade all regions to 128kb frame relay technology. Existing PCs have been connected to the LAN, and additional or replacement PCs will be added during the decade. We plan to upgrade all regional office and headquarters hardware to pentium computers over the next several years. We also plan to upgrade our servers to support the increasing workload.

We use the network to transfer STAR and SPAM input files, memoranda, electronic mail messages, support desk problems, and various other files to the regions. We plan to upgrade the

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network hardware and applications software to take advantage of the new graphical user interface windowing environment. This will provide efficiencies in training by providing a standard interface for new software products and decreasing the time required to implement new products.

F. CAPI

We began testing CAPI methodology in the 1980s. Feasibility tests showed that the methodology showed promise but that the hardware was too heavy, battery life too short, and capacity too small to conduct current surveys. Late in 1991, we began prototyping a CAPI system to collect Current Population Survey (CPS) data throughout the country. The CASIC concept covers this initial work.

In January 1994, we began collecting live CPS data using CAPI/CATI methodology. Other major surveys are scheduled to adopt CAPI methodology over the next few years. We initiated an inter-divisional team to evaluate our current CAPI technology in April 1994 and plan to enhance this environment to provide better reliability, reduce support requirements and support ever increasing workloads. In 1995, we purchased hardware and Xcellenet software necessary to replace our current bulletin board CAPI operation with a communications client-server package designed for this purpose. We plan to redesign our operations to take advantage of the functionality offered by the Xcellenet system.

Software developers will use the existing CAPI system to develop survey-specific functions as additional surveys adopt the CAPI methodology. We plan to redesign the CAPI environment to take advantage of new technology including object oriented analysis and design and graphical user interfaces (GUI). System enhancements will include field representative performance, SPAM, administrative functions, computer-assisted training, full integration with the Master Sample Control system, automated listing control, and an upgraded case management system on the field representatives computer.

G. Field Representative Automated Payroll System (FRAPS)

Efforts are underway for the development of the Field Representative Automated Payroll System (FRAPS). FRAPS will enable the Census Bureau to consolidate the processing of field staff payroll to the National Finance Center.

H. MicroCATI/CENCATA

The CATI support includes installing new survey instruments, maintaining the network which links Headquarters, Hagerstown, Tucson, Jeffersonville, and special programming requests for the microCATI and CENCATI systems. We plan to use tools provided by CASIC for CATI as these tools complete the development cycle and become available for production use.

Enhancing current automation and integrating these functions requires the support, coordination and participation of the demographic program areas and the statistical and methodology areas. It requires a complete reevaluation of how the Census Bureau collects, manages, and processes data. Although functionally distinct operations, these methods must be integrated and managed as a single system.

Coordinated with the development of new CASIC technology requiring more powerful computer systems will be a systematic technology refreshment effort to replace all of our 386 and 486 computers with current technology pentium level systems.

We also plan to research and implement if feasible automatic software distribution to the CATI facilities. This will require additional software at a minimum.

I. Networking and Application Monitoring

In 1995, we purchased monitoring servers from Notification Technologies Incorporated. We plan to use these to monitor critical systems and the system and application processes that run on these systems. We will integrate the monitoring routines built into LAN monitoring tools of other applications into this server. Applications will be modified over time to take advantage of this monitoring facility.

The NTI platform is currently a 486 desktop computer running Windows 3.1. NTI is moving this to a Windows NT based system in 1996 and adding a Novell NLM client to their system. This will require additional client licenses and hardware upgrades as this additional functionality is built into this system.

J. LAN/Communications Operations

As operations continue to increase and workloads become heavier the need to upgrade communications in support of all Field Division/Technologies Management Office operations increases. Starting in FY 1996, we will start upgrading all communications to our LAN servers and SUN systems.

K. Other Regional Office Automation

We are working with staff from Jeffersonville to integrate their inventory tracking system with the systems used in the regional offices. We have been researching a personnel system to be integrated with the cost and progress and control systems. An applicant application was written by regional office personnel and we will review it. An applicant file should feed the personnel system and be used for recruiting.

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The Information Services Program (ISP) uses a VAX-based activity tracking and reporting system. A revised PC-based reporting system is being designed for ISP and will require upgraded hardware.

To take full advantage of the CAI technology several automated training activities are being researched. They include computer-based instruction, enhanced editing capabilities, and on-line documentation. Off-the-shelf software exists for many of these functions.

PROPOSED ARCHITECTURE

Traditionally, we have automated various tasks in the regional offices using different systems which do not exchange data. The result is duplicate keying of the same information into the various systems. It also results in duplicate system development, maintenance, and storage. This is not practical considering the high cost of system development and maintenance.

PROGRAM BENEFITS

Benefits includes increased customer satisfaction, a major reduction in number and complexity of systems to be supported, more predictable and reliable data collection activities, improved data quality and timeliness, and scalability of systems based on size of project. Development of Administrative Systems will ensure adherence to Federal personnel and payroll requirements.

- **Increased customer satisfaction**

Data collection has focused on accuracy of data. Systems used to perform the data collection have been a combination of methods devised in large parts by the regional office staffs to do their job. We believe that this automation effort will be much more efficient and will lead to streamlined processing. This will result both in more timely submission of data to sponsors and the ability to perform more data collection with the same staffing levels.

Increased productivity of field representatives will result from reduced paper work requirements and usage of off hours for automated data transfer.

- **Major reduction in number and complexity of systems to be supported**

The current architecture at the Census Bureau has many systems doing similar functions in such areas as data capture, case control, data editing, cost and progress reporting. As mentioned throughout this initiative, Field Division/Technologies Management Office is working with the CASIC staff to evaluate new tools designed to reduce the number of systems required to be supported by Field and other organizations. With fewer systems to support and less need for product customization, we should be able to handle more surveys and satisfy more sponsors. Since this is cost reimbursable work, the entire Census Bureau will benefit from this direction.

- **More predictable and reliable data collection activities**

We have in the past not only provided the regional offices with a lot of flexibility, but almost required that they develop the custom solutions needed to do their jobs. They have exported the available data into locally designed and built databases and constructed individualized case management systems. Providing this functionality in a form usable by all the regions will allow them to focus on processing and help provide a uniform product across all the regions. In addition, problem resolution and troubleshooting will be simplified for Headquarter support staff.

- **Improved data quality and timeliness**

Implantation of automated survey processing control systems will allow us to reduce or at least contain survey processing costs. Providing sample address lists to the regions, case management tools with case check-in and distribution and electronic troubleshooting and messaging with a uniform system across all regional offices will reduce the time required to produce and send data as well as make for a more consistent product.

- **Scalability of systems based on size of project**

We have always built solutions designed to solve the requirements of a particular survey or census. Moving to new hardware platforms normally means redesign or porting of the application. With a scalable systems designed for an open systems environment, we should have much less need for customized programming efforts and severely reduce the need for massive redesign efforts. The benefits resulting from this include reduced staff time, faster implementation of new surveys and the ability to do more work with fewer resources.

3. Security

We will comply with the security mandates as required by Title 13 of the United States Code and with Office of Management and Budget Circular A-71.

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PART II - ANNUAL PLAN

1. Architecture Status

The architecture described in Part I will remain valid for at least the next five years.

The only support service contracts in use under this PDP are hardware and software maintenance contracts.

2. IT Objectives

We plan to implement the following IT objectives.

- Redesign the CAPI application using Commercial Off The Shelf (COTS) Software
- Planning and implementation of decennial support activities
- Improve our LAN and WAN production support system to increase reliability and include active monitoring

3. Status

A. Accomplishments/Progress

Our major progress during the past year has been in improving CAPI production support activities and implementing a master control system for CAPI/CATI. This has moved us closer to our strategic goals by providing a more stable and robust network infrastructure supporting production processing.

B. Current Plans

The Field Directorate will continue automation efforts by migrating paper data collection efforts to the CAPI environment. We plan a major enhancement to the existing CAPI system by moving to a COTS software solution. We found, tested, and purchased XcelleNet Remoteware in FY

1995 to address the deficiencies in our current CAPI system and add new capabilities to the system. We plan for the XcelleNet system to include four Remoteware serves spread across two locations to provide redundancy and fault tolerance to this critical application. For FY 1996, we will use consulting services available from the XcelleNet vendor to do a detailed analysis of system requirements and design a system to satisfy all of our requirements and fully use the new capabilities of the product. We will need to procure additional hardware and software needed to implement this system. Our goal is to build a fault tolerant CAPI operation spread across two locations which will provide automatic fail over to either of the two locations without disrupting our production processing. Initially the two locations will be at Suitland and Washington Plaza using a 10 Mbit per second connection. When the technology to connect Suitland and Jeffersonville, Indiana becomes available and affordable, we plan to move the Washington Plaza location to Jeffersonville. We are currently beginning to evaluate software that will allow us to "mirror" a file server to a second file server.

- **Data Keying**

In the next year, we plan to move all remaining data keying work from the regional offices to Jeffersonville. We will be researching the use of imaging technology to support this move, particularly for PAMS/ADAMS.

We plan to have a direct link between cost and projects by downloading data from the check-in system. This will eliminate keying survey progress data. This application will lead to the development of the Collection Control File and reports to be used for the 2000 decennial census.

- **Cost and Progress**

We will continue to work closely with Personnel Division and the Administrative and Networking Support Staff (ANSO) to convert the field representative's payroll system. We will continue with the progress and development of the cost and progress system.

- **STAR/SPAM**

We will continue with the automation of the process of survey control. We will begin purchasing additional software licenses and equipment, which will be needed once all survey performance has been converted from RAM to SPAM.

- **Decennial**

- Decennial Field Interface

- We will continue working with Decennial Management Division and the Demographic Directorate to define processing requirements for the Census 2000. The planning, development, testing and dress rehearsal for these systems will take place in the next two

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years. The Technologies Management Office will be responsible for putting in place the development environment necessary to accomplish these tasks. Additionally, the TMO will establish a testing environment (i.e., BETA site) to simulate those operations that will be conducted at the regional offices, regional census centers, local collection offices and field operation supervisor offices. This facility will replicate the production environment for dress rehearsal, and ultimately the 2000 decennial census, and it will provide an environment for researching, evaluating and testing proposed technologies, such as image capture, optical character recognition, alternative network configurations, data storage, and image retrieval. This will also include the procurement of all hardware, software, telecommunications, and support services for field operations of the dress rehearsal and Census 2000.

PAMS/ADAMS

PAMS/ADAMS will utilize the state-of-the-art computer technology to maximize information management. The goal of the PAMS/ADAMS system is to provide an automated enterprise-wide system which will support the hiring of employees, process personnel actions, pay employees, provide reports and data outputs, and maintain historical data through the use of an integrated, comprehensive, centralized database shared by users throughout the organization. Data entry edits will be increased at the local census offices to reduce the editing at the regional census centers. Automated balancing and the capability for interactive processing for ad hoc reports in a user-friendly environment will make the system easier to operate in the local census offices and the regional census centers.

Field Staff Training/Development and Research/Evaluation

Field staff will continue to support the decennial and survey areas in the development of training packages and in the research/evaluation of projects. In order to accomplish these support functions, we will require equipment and software specifically designed for training and statistical analysis.

Geographic Operations

Most of the geographic equipment is needed at Headquarters and the regional offices for new staff that we will be adding as preparation for the 2000 census geographic operations expand and increase. A few items are to replace aging equipment. Listed below are some of the geographic operations that the additional staff will be working on:

- map production for the 2000 redistricting data program
- map production for the 2000 statistical areas program
- digitizing for the 2000 redistricting data program
- digitizing for the 2000 statistical areas program

- contacts and material and file interaction with state and local government officials for:
 - ◆ the 2000 redistricting data program
 - ◆ the 2000 statistical areas program
 - ◆ the Program for Address List Supplementation (PALS)
 - ◆ the TIGER Improvement Program (TIP)
 - ◆ the Master Address File Geocoding Operating Resolution
 - ◆ the Local Update of Census Addresses
 - ◆ the Digital File Exchange (DEX) program
 - ◆ the Address System Information Survey (ASIS)
- **Office Operations**

The Telecommunications Office has upgraded all regions to 128kb frame relay technology. Existing PCs have been connected to the LAN, and additional PCs will be added during the decade. We also plan to upgrade our servers to support the increasing workload.

- **CAPI/CATI**

Laptop Case Management

Over the next 2 years, laptop case management software will undergo a redesign into object oriented technology. This redesign will bring the laptop case management software into a windows environment. This redesign will provide the following functionality:

- Case Management shell and interface with CASES and non-CASES instruments.
- Listing Management shell and interface for Automated Listing instruments.
- Case Management shell and interface to the Field Representative Automated Payroll System (FRAPS).
- Interface to XCELLENET transmission software including encryption software.

This redesign will require the purchase of various software development tools. These tools include:

- Object Oriented CASE Tools used for the design and analysis in systems development.
- Object Oriented Graphic User Interface Software Development Tools.
- Automated Graphic User Interface Testing Tools.
- Configuration Management Tools.

The laptop case management redesign will require purchase of laptops which can run Graphic User Interface (Windows) products and upgrading memory in existing laptops.

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This will be covered under the Next Generation Portable Interviewing Device (NGPID) analysis.

Depending on the system requirements of the redesign, applications or vendor consultants may be needed to provide technical direction and guidance for the project.

Computer Assisted Personal Interviewing (CAPI) Central Systems Redesign

Over the next 2 years, CAPI central system software will undergo a redesign into object oriented technology. This redesign will bring the central system software into a windows environment. In addition to improving existing CAPI central functionality, this new system will provide:

- Integration of CAPI Central System with the ATLAS sample control system.
- Integration of CAPI Central System with FRAPS laptop data.
- Development of standard user interfaces for like functions across multiple CAPI surveys.
- Reduction or elimination of manual operations required by the existing CAPI central design.
- Incorporation of Survey Performance and Management (SPAM) (survey performance) data.

This redesign will require the purchase of various software development tools. These tools include:

- Object Oriented CASE Tools used for the design and analysis in systems development.
- Object Oriented Graphic User Interface Software Development Tools.
- Automated Graphic User Interface Testing Tools.
- Configuration Management Tools.
- Telecommunications Software.

The CAPI central system redesign will run on regional office clients. These clients should be covered under the PCMAP9601 requirements analysis.

Depending on the system requirements of the redesign, applications or vendor consultants may be needed to provide technical direction and guidance for the project.

The current laptop computers in use by the Field Representatives are now approaching three years in service. We plan to purchase or lease 2000 replacement laptop computer systems and 1800 modems in FY 1996. We plan to replace 1900 of these systems and modems in FY 1997. In FY 1998 and FY 1999 we will replace 1900 systems each year.

This need for technology refreshment is ongoing due to reliability concerns as well as constantly increasing performance requirement imposed by commercial software.

Computer Assisted Telephone Interviewing (CATI) Redesign

Over the next 2 years, CATI case management software will undergo a redesign into object oriented technology. This redesign will bring the central system software into a windows environment. This redesign will enhance existing functionality.

This redesign will require the purchase of various software development tools. These tools include:

- Object Oriented CASE Tools used for the design and analysis in systems development.
- Object Oriented Graphic User Interface Software development Tools.
- Automated Graphic User Interface Testing Tools.
- Configuration Management Tools.
- Telecommunications Software.
- Locator/phone number assistance software.

The CATI central system redesign will run on telephone center clients. These clients should be covered under the PCMAP9601 requirements analysis.

Depending on the system requirements of the redesign, applications or vendor consultants may be needed to provide technical direction and guidance for the project.

- **Field Representative Automation Payroll System (FRAPS)**

During FY 1996 and FY 1997, we will develop and implement the Field Representative Automated Payroll System. FRAPS will be the payroll "front-end" for approximately 3,000 field employees, FRAPS will enable the Census Bureau to consolidate the processing of field staff payroll to the National Finance Center (NFC). The FRAPS system will increase the timeliness and accuracy of field employee payrolls. The cost and progress systems may need to be revised to accommodate this conversion. Due to the critical nature of this operation, a Sparc Server will be dedicated strictly for the use of FRAPS. In addition, all regional office administrative areas will require state-of-the-art computers and 4SI laser printers for FRAPS processing. Additional hardware to tie this equipment into the FRAPS processing environment will also be required.

- **CENCATI**

The CATI support includes installing new survey instruments, maintaining the network which links Headquarters, Hagerstown, Tucson, Jeffersonville, and special programming

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requests for the microCATI and CENCATI systems. We will use tools provided by CASIC as these tools complete the development cycle and become available for production use. Coordinated with the development of new CASIC technology requiring more powerful computer systems will be a systematic technology refreshment effort to replace all of our 386 and 486 microcomputers with current technology pentium level systems.

- **Network and application monitoring**

The Field Representatives use software on laptop computer systems to receive software and surveys from and transmit completed survey instruments to a central computer at headquarters. The received survey data are initially stored on a Novell file server, then moved to a SUN workstation, put into an Oracle database and distributed back to the survey sponsors. The existing system has several limitations, the most notable being the use of bulletin board software (PCboard) to handle the Field Representatives dial in sessions. We found, tested, and purchased XcelleNet Remoteware in FY 1995 to address the deficiencies in our current CAPI system and add new capabilities to the system. XcelleNet is a commercial client-server product which will provide more efficient communications support to our Field Representatives. The most important new capabilities it will provide us are the ability to automatically distribute software and to reduce transmission times and costs. In FY 1996, we will use consulting services available from the XcelleNet vendor to do a detailed analysis of system requirements and design a system to satisfy all of our requirements and fully use the new capabilities of the product. Our goal is to build a fault tolerant CAPI operation spread across two locations which will provide automatic fail over to either of the two locations without disrupting our production processing. We are currently beginning to evaluate software that will allow us to "mirror" a file server to a second file server.

- **LAN/Communications Operations**

During FY 1996 and FY 1997, we will need to upgrade communications in support of all Field Division/Technologies Management Office operations. The Graphic User Interface based applications are connectivity intensive. Therefore, the division will be upgrading communications to all of our local area network servers and SUN systems to 100MB ethernet throughput. To get this throughput all of the ethernet cards will have to be replaced in each system involved. The communications interfaces will be upgraded, including the Synoptics concentrators and Cisco switches. The switch to 100MB ethernet may also necessitate upgrading some cabling to Category 5 cable. This work will be done throughout the Headquarters and field sites. We will upgrade the memory on CATI servers at all three telephone centers to 128 MB from the current standard configuration of 64 MB. CATI workloads are increasing annually as new surveys are automated. This increased load leans heavily on server memory resources. Current loads periodically utilize memory resources to their limits.

Currently there are approximately 100 CATI interviewers in Jeffersonville. As CATI phase 2 production comes into place, the maximum capacity available to date will increase to 130 interviewers. In order to be able to handle this additional load a new CATI server and backup machine will need to be added.

We will upgrade memory on all workstations at all three telephone centers to 16 MB. The current setup of DOS based applications needs to be upgraded to a Windows based to take advantage of multi-tread, multi-tasking and Graphic User Interface capabilities. By bringing telephone centers to a Windows base, they will be at par with all regional offices and headquarters where Windows is already the base operating system.

Expand CD-ROM towers at all three telephone centers and headquarters to 14 IDs per site. The current CD-ROM towers at each site have 7 drives of the old dual speed technology, while the telephone data base being used encompasses 10 CDs. The new towers will be six speed or better. The excess dual speed drives will be used for software documentation and other uses.

Personal computers for CATI Research/Information Center. Several of the incoming surveys will continue the path already established by several surveys of having an ongoing research phase. This A "state of the art" Research/Information Center is needed to perform survey research with the most up-to-date information resources available.

- **Other Regional Office Automation**

We will continue to work with staff from Jeffersonville to integrate their inventory tracking system with the systems used in the regional offices.

We will take advantage of all training, personnel, and administrative activities, which are being automated. We will work to ensure that the regional offices are brought up to speed and can take advantage of all automated activities.

Paperless FAX Image Reporting System (PFIRS)

The Technologies Management Office has entered into a partnership with Statistical Research Division (SRD) to design and implement a "production" PFIRS reporting system in FY 1996 and FY 1997. Not all of the components of the implementation plan have been fully evaluated and may change in the future. The PFIRS offers survey sponsors multiple new survey processing capabilities within the one system.

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Computerized Self-Administered Questionnaire (CSAQ)

The Computerized Self-Administered Questionnaire technology is a survey activity in which a prototype system was developed by the Economic Planning and Coordination Division (EPCD) in order to prove the concept.

The concept involves delivering a computerized version of a survey questionnaire to respondents either by mailing disks loaded with the CSAQ application or transmitting the CSAQ application via modem. Once loaded on the respondents computer, the CSAQ application leads the respondent through the questionnaire and allows them to respond interactively--while performing specific data and consistency edits. In some cases, the respondent may also set up their computer system to automatically import the desired data into the CSAQ. The reported data are then sent back to the Census Bureau either by floppy disk or modem (possibly using the standard EDI format) where it is checked for accuracy and merged with Census files/databases.

Now that the concept has been proven and accepted by survey sponsors, the Technologies Management Office has entered into a partnership with the Economic Planning and Coordination Division to design and implement a "production" CSAQ reporting system in fiscal years 1996 and 1997. Not all of the components of the implementation plan have been fully evaluated and are subject to change.

Contract Support During Off Hours

Offer a service that will respond to an ATTention! server alarm, or a page from an employee. Coverage will be from 6:30 p.m. to 6:30 a.m. This will require a systems analyst versed in the following:

- Sun Solaris
- Novell Netware 3.X and 4.X
- TCP/IP
- IPX/SPX
- Xcellenet
- Oracle database

The response time needed will be to arrive at the Census Bureau within a 2-hour time frame. People involved with the service must be trained in the beginning, then will be required to meet monthly to remain current with CAPI.

The areas responsible for servicing are:

- Dial-in modems
- Chatterbox PCs

- CAPI servers
- Sun Solaris CAPI processors
- XcelleNet servers

4. Implementation Schedule

We have developed one Requirements Analysis to cover our known needs for FY 1996 and FY 1997 which is currently in final draft and documents our specific requirements needed to accomplish our current plans. The needs for our Next Generation Portable Interviewing Device are documented in an approved Requirements Analysis covering FY 1995 through FY 1999.

